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Civil Engineering

ELECTRIC POWER SYSTEMS

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This instruction implements Air Force policy directive (AFPD) 32-10, *Installations and Facilities*, by assigning responsibilities for providing, operating, maintaining, and accounting for electrical power and other selected electrical systems. The Chief Electrical Engineer, Headquarters, Air Force Civil Engineer Support Agency, Operations Directorate (HQ AFCESA/CEOA), is the final interpretation authority for definitions and guidance contained in this document. This publication applies to Air Force Reserve Command (AFRC) units and the Air National Guard (ANG). Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force manual (AFMAN) 33-363, *Management of Records*, and disposed of in accordance with the AFRIMS (Air Force Records Information Management System) Records Disposition Schedule (RDS) located at **https://www.my.af.mil/gcss-af61a/afrims/afrims**/. Users should send comments and suggested improvements on AF IMT 847, *Recommendation for Change of Publication*, through major commands (MAJCOM) and HQ AFCESA, 139 Barnes Drive, Suite 1, Tyndall AFB, FL 32403-5319, to HQ USAF/A7C, 1260 Air Force Pentagon, Washington, D.C. 20330-1260. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force. See Attachment 1 for a glossary of references and supporting information.

SUMMARY OF CHANGES

This interim change clarifies generator forms management, emergency generator support for a single facility, and medical facilities generator testing requirements.

1. Base Civil Engineer (BCE) Responsibilities. The BCE has the following responsibilities:

1.1. Provide, operate, and maintain all real property electrical power systems and equipment. Operate and maintain equipment authorization inventory data (EAID) equipment assigned to the BCE, including operating and maintaining real property installed equipment (RPIE) items, except units supporting missile systems.

1.2. Provide and maintain other real property and RPIE electrical systems, such as:

1.2.1. Controls, sensors, and alarm circuits needed for operation of real property facilities, such as tank liquid level sensors and alarms.

1.2.2. Fire alarm systems.

1.2.3. Mass notification systems.

1.2.4. Systems for utility plant management and distribution, such as energy management and control systems (EMCS), which includes supervisory control and data acquisition systems (SCADA) and utility monitoring and control systems (UMACS). Installation of any electrical system, motor, or generator security device, such as those to mitigate any electrical system vulnerability, shall be approved in writing by HQ AFCESA/CEOA.

1.3. Install and maintain the electrical distribution system operating at any frequency. Users are responsible for frequency generators/converters installed on equipment. Install surge protection in accordance with Unified Facilities Criteria (UFC) 3-520-01, *Interior Electrical Systems*, and National Fire Protection gency (NFPA) 780, *Standard for the Installation of Lightning Protection Systems*, for protection against switching and lightning surges. Distribution and other electrical equipment shall not be installed in manholes.

1.4. Ensure EAID or RPIE generators and any other energy source (i.e., solar panels, fuel cells, wind generators) do not tie into, transfer power to, or synchronize with any real property electrical system (i.e., transformer, switch gear, or utility) unless authorized by the BCE. New facility tie-ins shall be coordinated with the MAJCOM during project design reviews and before installation. Emergency and standby generators are permitted to be used as utility tariff control provided operation is limited to 100 hours per year, there is no remote/external control of the generator, environmental permits are not violated, and

operation does not adversely affect the mission. Any generator used as utility tariff control shall be reported to HQ AFCESA/CEN (information copy to HQ AFCESA/CEO), 139 Barnes Drive, Suite 1, Tyndall AFB, FL 32403.

1.5. Service special-use facilities and power conditioning and continuation interfacing equipment (PCCIE), if applicable, as described in **paragraph 2**

1.6. Maintain current records of equipment operation, maintenance, repair, and replacement, including AF IMT 719, *Historical Record - Diesel-Electric Generator and System***,** for the life of the generator; AF IMT 487, *Emergency Generator Operating Log (Inspection Testing)*, or other MAJCOM-approved form**,** for three years within the shop then archive until the unit is replaced.

1.7. Conduct an inventory of all emergency and standby generators each year and send a copy to the MAJCOM. Reconcile inventory results with real property records for RPIE generator accountability or with custodian authorization and custody receipt listing (CA/CRL) records for EAID generators (see paragraph 3). Include the following data for each generator in the inventory:

1.7.1. Location (building number and, if available, geographic information system (GIS) coordinates, including height). For EAID generators, indicate the primary-use facility.

1.7.2. Capacity in kilowatts (kW).

1.7.3. Voltage.

1.7.4. Manufacturer, make, and model of both alternator and engine.

1.7.5. Single- or three-phase.

1.7.6. Type of fuel.

1.7.7. Fuel tank above or below ground, integral or separate fuel tank, and fuel tank size.

1.7.8. Run time on full tank.

1.7.9. Serial and stock numbers.

1.7.10. Year manufactured.

1.7.11. Cumulative generator run time (in hours).

1.7.12. Proper account listing (RPIE or EAID).

1.7.13. Maximum demand load.

1.7.14. Automatic transfer switches, 3 or 4 pole, make, and model.

1.8. Develop and maintain the following documents, and ensure that they are kept accurate and current:

1.8.1. Electrical power system capability studies, including relay calibration and utility pole infrared scans.

1.8.2. Record drawings.

1.8.3. Facility schematics.

1.8.4. Connection diagrams.

1.8.5. One-line electrical diagrams.

1.8.6. As-built drawings depicting electrical power system equipment.

1.8.7. Operation and maintenance (O&M) manuals, including warranty information, if applicable.

1.8.8. Refueling plans to support generator operation during extended power outages at mission essential/critical facilities. Coordinate refueling plans to ensure refueling plan supportability during extended outages. For generator sites located off-base, size the fuel tank for 72-hour run time dependent on estimated load fuel consumption.

1.8.9. Copies of environmental permits, with restrictions.

1.8.10. Historical records of energy usage by the facility, including AF IMT 487 or other MAJCOM-approved form kW readings when supported by a generator.

1.8.11. Current waivers.

1.9. Adhere strictly to special accountability requirements for generators (see **paragraph 3**).

1.10. Train users (appointed in writing to BCE by facility managers) annually (training includes procedures required for safe start and operation of electrical power systems). This includes review and compliance with the latest version of NFPA 70E, *Standard for Electrical Safety in the Workplace*. Post a list of authorized generator operators near the generator control panel and ensure that only personnel who are properly trained and documented start or operate the electrical system.

1.11. Maintain electrical power generating systems at special-use facilities under the operational control of others only as defined in the applicable support agreement.

1.12. Develop a memorandum of agreement (MOA) or memorandum of understanding (MOU) for each special-use facility, if applicable. Ensure Judge Advocate review of any MOA or MOU. The memorandum will state:

1.12.1. The user organization operates and performs operator-level maintenance for all emergency power plants supplying electrical power exclusively to these facilities.

1.12.2. The BCE performs the intermediate-level maintenance and arranges for depot-level maintenance on equipment, and may assist with operator-level maintenance on an as-required reimbursable basis.

1.12.3. The BCE retains the real property accountability for the generating units that supply emergency power exclusively to these facilities.

1.13. Provide installation and maintenance support of electrical power systems, fire protection systems, Joint-Services Interior Intrusion Detection Systems (J-SIIDS), and electrical heating and air-conditioning systems of equipment similar to RPIE. Include systems temporarily deployed during exercises, or contingency or wartime operations, or systems permanently assigned to an installation.

1.14. Assume O&M responsibilities for other user organization electrical systems when all other parties agree. Negotiate such agreements only if they cut costs and improve support. Document them as memoranda of agreement or host–tenant support agreements, and

prescribe support on a reimbursable basis, if appropriate. Ensure Judge Advocate review of any agreements negotiated.

1.15. Ensure that personnel comply with AFI 32-1064, *Electrical Safe Practices*, Air Force Occupational Safety and Health Standard (AFOSHSTD) 91-501, *Air Force Consolidated Occupational Safety Standard*, and UFC 3-560-01, *Electrical Safety O&M.*

2. Conditioning and Continuation Interfacing Equipment (PCCIE). PCCIE is classified as equipment. For guidance on acquisition and maintenance of this equipment, contact the PCCIE Product Group Manager, 500 CBSS/GBLD, Building 1207-N, 6029 Wardleigh Road, Hill AFB, UT 84056-5838.

2.1. Users shall include PCCIE in mission equipment acquisitions when needed to accomplish that mission and coordinate all PCCIE installations with the BCE. The purchasing organization initiates action to place an item on the allowance standard (AS) of the equipment served. When the equipment requires installation support, include it in the purchasing agreement, construction project, or statement of work. Otherwise, charge installation expenses to the O&M account of the user.

2.2. PCCIE maintenance shall be included with the mission equipment it serves. If the user cannot obtain a maintenance contract, and if the BCE agrees to take maintenance responsibility, the user shall reimburse the BCE maintenance account for time and material.

3. Accounting for Generators. Account for all generators either as RPIE or EAID.

3.1. Real Property Installed Equipment (RPIE). List any generator installed in a facility on the real property record as RPIE. A permanently installed generator that is an essential component of an electrical power system and supports mission essential or critical functions is considered RPIE equipment. Notify the real property office if these generators are temporarily or permanently relocated from one facility to another. Account for RPIE generators awaiting installation in the appropriate work order documents. For excess generators and associated equipment (i.e., automatic transfer switches), ask the MAJCOM for review and disposition instructions before removing the generator and associated equipment from a RPIE facility. After removing a generator, account for it on Department of Defense (DD) Form 1149, **Requisition and Invoice/Shipping Document**, if the generator is shipped to another base or to the Civil Engineer Maintenance, Inspection, and Repair Team (CEMIRT). If the generator is turned in to the Defense Reutilization and Marketing Office (DRMO), account for it on DD Form 1348-1A, **Issue Release/Receipt Document**. MAJCOMs will report excess generators larger than 200 kW to the Field Support Directorate at HQ AFCESA (HQ AFCESA/CEM).

3.2. Equipment Authorization Inventory Data (EAID). EAID generators are essentially portable. Classification as RPIE or EAID is determined by generator use.

3.2.1. EAID generators are listed in AS, requisitioned from Warner Robins Air LogisticsCenter (WR-ALC/LESGF), 295 Byron Street (Bldg 300-East Wing, Bay D), Robins AFB, GA31098-1647, DSN 472-1760, Comm (478) 222-1760, and accounted for by Base Supply and WR-ALC/LESGF.

3.2.2. EAID units that meet the RPIE definition should be reclassified or turned in to Base Supply. When reclassifying a generator, coordinate with the Item Manager, WR-

ALC/LESGF. Also report excess EAID generators to WR-ALC/LESGF. Any RPIE or commercial EAID generators that are no longer required or are inoperable should be identified to the MAJCOM for review and disposition coordination. Disposal of mobile electric power (MEP) EAID generators should be first coordinated with the EAID Item Manager at WR-ALC/LESGF. If generators are not required or needed by WR-ALC/LESGF, they should be disposed of in the same manner as RPIE and commercial EAID generators.

4. Validating Existing Emergency Generators. Review all AF IMTs 487 at least annually to verify that generators and associated equipment are adequate and reliable. When AF IMT 487 does not provide a generator's true load, use alternative data—such as clamp-on ammeter readings, building and equipment wiring schematics, and equipment power consumption data—to determine the generator's actual load.

4.1. If monthly load testing conducted in accordance with paragraph 7 of this instruction using normally connected loads produces loading of less than 50 percent of rated capacity in a 12- month period, the following steps will be taken (Exception: Generators used solely to support motor air conditioning loads may be sized to meet inrush current demands, and RPIE generators less than 25 kW do not have to meet the requirements of **paragraph 4.1.1** or **4.1.2** For generators, the Air National Guard [ANG] is exempt):

4.1.1. The generator shall be programmed for replacement with a smaller unit sized to achieve a loading range of at least 50 percent, or

4.1.2. A new load study and justification to keep the current generator shall be accomplished and forwarded as a waiver request to the MAJCOM Electrical Engineer. The load study and waiver shall not exceed one year and shall be kept with AF IMT 719.

5. Emergency and Standby Power Authorizations.

5.1. The Air Force authorizes use of emergency or standby diesel generators when needed to support mission-critical functions. A generator installed to support a mission-critical facility shall be installed and connected to only provide power to that specific facility. Utilizing one generator to support multiple facilities is not authorized because if the generator were to fail it would jeopardize multiple missions. If unique circumstances exist where one generator is needed to support multiple facilities, a waiver request must be submitted and approved by the MAJCOM. Authorizations and corresponding generator classification permitted are listed in paragraphs 5.1.1 through 5.1.26, per UFC 3-520-01. A MAJCOM/A7 (Civil Engineer) has authority to approve additional emergency or standby generator authorizations not listed in these paragraphs as long as they support mission-critical functions; this authority may not be re-delegated. MAJCOMs also have authority to approve additional mission critical authorizations at the written request of the BCE or equivalent. BCEs will keep authorization approval letters for these additional requirements on record and have them readily available for inspection. Emergency generator systems are defined as RPIE installations incorporating automatic transfer switch (ATS) arrangements. Standby generators are defined as EAID generators incorporating double-throw disconnect switches and Cannon plug type connections in accordance with paragraph 7.2. All generators shall operate on the fuel type defined in AFI 32-1062, *Electrical Power Plants and Generators*. Natural gas generators are not authorized for backup power for critical missions or facilities. Whole building generator

systems require HQ AFCESA/CEO approval. Recommended generator classifications are noted in parenthesis.

5.1.1. Medical treatment facilities in accordance with UFC 4-510-01, *Design: Medical Military Facilities*.

5.1.2. For Air National Guard installations, authorized emergency generators are identified in Air National Guard Engineering Technical Letter (ANG ETL) 01-1-1, *Air National Guard Design Policy*.

5.1.3. Air navigation aids and facilities, and airfield lighting (Emergency).

5.1.4. Mission/emergency-essential refrigerated storage rooms (Standby).

5.1.5. Petroleum, oil, and lubricant (POL) storage and dispensing facilities (Standby).

5.1.6. Mission-essential/critical utility plants and systems (Emergency or Standby).

5.1.7. CE control centers (Emergency).

5.1.8. Mission-essential/critical communication facilities and telephone exchanges (Emergency).

5.1.9. Fire stations, including fire alarm, fire control, and radio equipment (Emergency).

5.1.10. Mission-essential computer automated data processing facilities (Emergency).

5.1.11. Air traffic control towers (Emergency).

5.1.12. Base weather stations (Emergency).

5.1.13. Surveillance and warning facilities (Emergency).

5.1.14. Command and control facilities (does not include HQ facilities without command and control functions) (Emergency).

5.1.15. Weapons systems (Emergency).

5.1.16. Entry control points, security gates, and related security lighting systems (Standby).

5.1.17. Aircraft and aircrew alert facilities (Emergency).

5.1.18. Law enforcement and security facilities (Emergency).

5.1.19. Disaster preparedness control centers (Emergency).

5.1.20. Mission, property, and life support facilities at remote and not readily accessible sites, such as split-site aircraft warning and surveillance installations (Emergency).

5.1.21. One feeding facility per installation or geographic location (MAJCOM may approve additional facilities.) (Standby).

5.1.22. Industrial facilities that have noxious fumes requiring removal (Provide power for the exhaust system only.) (Emergency) (Aircraft fuel cell repair facilities are not authorized emergency or standby power.)

5.1.23. Readiness facilities relying on electrical power to support tactical or mission-essential operations (requires MAJCOM approval) (Emergency).

5.1.24. Photographic laboratories providing mission-essential support to combat and contingency tactical missions (Emergency).

5.1.25. Simulation or materials laboratories where continuous power is needed for human safety or to maintain low tolerance temperature (<5 degrees) and humidity (<5 percent) control to avoid catastrophic consequences. (Emergency).

5.1.26. Emergency lighting, elevators, fire alarms, security systems, or other life safety equipment within high-occupancy buildings or places of assembly of 1,000 or more people, for the purpose of moving people out safely. (Emergency).

5.2. When only a portion of a facility is authorized emergency power, that portion of the facility shall be placed on a separate subpanel. This subpanel shall be fed from the generator and switched by either a manual or automatic transfer switch, depending on the mission of the facility. For existing facilities without separate critical loads (subpanels), replacement generators and transfer switches shall be sized only for the authorized emergency load, and a plan shall be devised for load shed of non-critical loads. Uninterruptible power supply (UPS) battery charging is not considered a critical/mission-essential load during generator operation and shall be turned off. For UPS systems not capable of battery charger elimination during generator operation, charging shall be limited to 5 percent of generator capacity.

6. Applicable Codes. The codes listed in **Attachment 1** and host nation codes apply.

7. Maintaining, Testing, and Exercising Electrical Systems. Schedules and procedures for maintaining, exercising, and testing electrical systems shall be developed and maintained. Recommendations in NFPA 70B, *Recommended Practice for Electrical Equipment Maintenance*, and AFI 32-1062 shall be followed. If local conditions or operations justify variation in this paragraph and subparagraphs, MAJCOMs shall request a waiver from HQ AFCESA/CEO, 139 Barnes Ave, Suite 1, Tyndall AFB, FL 32403. A waiver is not required for overseas locations where the host nation retains responsibility for maintaining, exercising, and testing electrical systems, or where a Status of Forces Agreement dictates that the host nation's standards and procedures shall be followed. Building occupants shall be notified prior to testing under actual building load.

7.1. Automatic Transfer Switch Capability and Engine-Driven Generators. Automatic transfer switch capability and engine-driven generators shall be tested monthly in accordance with **subparagraphs 7.1.1** through **7.1.9.5**:

7.1.1. Test generators under actual building load during peak load periods to ensure proper automatic transfer switch operation, generator capacity, and overall system reliability. Deployable generators shall be tested in accordance with **paragraph 7.3**.

7.1.2. Generators may be started/idled in preparation to support a scheduled mission fast transfer; however, for the purposes of **paragraph 7.**, this is not considered a generator test

7.1.3. Electrically load RPIE and EAID generators to at least 50 percent of rated capacity during monthly tests using connected facility loads. Deployable generators shall be tested in accordance with **paragraph 7.3.** ***Exception:*** RPIE generators rated at 25 kW or less are permitted to be tested with available connected load, which may not be 50 percent of rated capacity.

7.1.3.1. When the facility representative provides written notification and rationale to the Operations Flight Chief that critical temporary mission activity or requirements preclude testing generators using actual facility load, the MAJCOM Electrical Engineer may approve using load banks solely to achieve a minimum 50 percent generator-loading range; however, this shall be permitted only once per quarter because it fails to prove the operational reliability of the entire system. ***Exception:*** RPIE generators rated at 25 kW or less are permitted to be tested with connected load only and are not required to be augmented with load banks to achieve a minimum 50 percent loading.

7.1.3.2. If permission to perform the monthly test is refused by the facility owner, the Operations Flight Chief or equivalent shall explain to the facility representative or authority the possible risks of not conducting the test and indicate that the using agency accepts full responsibility for failure of the emergency backup system in the event of an actual commercial power outage. A written copy of the notification will be filed with the individual generator record. Furthermore, if any potential environmental, safety and health, operational, fiscal or mission risks are associated with a failure to perform the monthly test, the base/wing Staff Judge Advocate shall be notified and consulted. Such risks may also create potential legal liabilities for the Air Force and Air Force personnel.

7.1.4. Once an engine driven generator set reaches operating temperature and is loaded according to **paragraph 7.1.3**, the generators shall be exercised for a minimum of 1 contiuous hour.

7.1.4.1. Generator readings, excluding blocks 10 through 12, shall be entered on the front page of AF IMT 487 or MAJCOM-approved equivalent immediately after startup. A second reading will be taken 15 minutes after load is transferred on to the generator. Readings will then be taken every two hours and a final reading prior to transfer back to utility power even if transfer occurs immediately after the last reading. The highest KW load, voltage, and amperage readings will be annotated in blocks 10 through 12.

7.1.4.2. When connected to actual building load and while under generator operation, functionality of all connected building equipment and systems shall be verified by the facility manager.

7.1.4.3. Any problems shall be reported to the BCE and a representative from each user within the facility.

7.1.5. If, during the preceding 12 months, the generator has not been loaded to at least 50 percent of its rated capacity either through testing or in actual use, the generator shall be loaded to at least 75 percent of rated capacity using facility loads augmented with load banks, or load banks alone, and exercised for a minimum of two hours. If the generator passes the load test, follow guidance in **paragraph 4.1.1** or **paragraph 4.1.2** to revalidate the generator. Exception: RPIE generators rated at 25 kW or less are not required to be loaded to 75 percent even if they have not been loaded to at least 50 percent of rated capacity during the preceding 12 months; **paragraph 4.1.1** or **paragraph 4.1.2** guidance is not applicable to RPIE generators rated 25 kW or less.

7.1.6. Exercise emergency systems supporting navigational aids for air traffic control facilities according to this instruction and AFI 13-203, *Air Traffic Control*.

7.1.7. Exercise emergency power systems supporting Defense Communications Systems (DCS) or related communications activities according to Defense Information Systems Agency (DISA) Circular 350-195-2, *Auxiliary Electric Power Systems*.

7.1.8. Exercise emergency power systems that support composite medical facilities according to this AFI and NFPA 99, *Standard for Health Care Facilities*.

7.1.9. Generators supporting an actual power outage during the testing month do not require additional monthly testing, provided:

7.1.9.1. The outage duration was at least 1 hour.

7.1.9.2. The transfer switch operated properly during the outage.

7.1.9.3. Readings were taken while the generator was supplying power to the facility.

7.1.9.4. All items were checked/annotated on AF IMT 487.

7.1.9.5. Post operational inspection was performed.

7.2. EAID Generators.

7.2.1. Exercise EAID generators stored and ready for emergency use according to **paragraph 7.1.3** of this instruction. Use a load bank or connect the generator to a facility or system.

7.2.2. Exercise the unit annually while connected to the facility or system it primarily supports. Generator facility connections shall be in accordance with Engineering Technical Letter (ETL) 10-7, *Connection Methods for Standby Generators - 600 Volts or Less*.

7.2.2.1. No generator connection described in **paragraph 7.2.2** of any type is to be substituted for disconnecting means required by the NEC. Plugs-receptacles must be inspected for corrosion before each use. Correct as necessary and coat contacts with proper electrical connection corrosion preventative compound.

7.2.2.2. Proper strain relief must be provided to prevent loose connections.

7.3. Deployable Generators. The BCE will test CE deployable generators upon receipt. After tests and documentation of operating parameters on AF IMT 719 and AF IMT 487, these units will be purged, shelved, and prepared for immediate deployment. Deployable generators shall be inspected and operationally tested every six months for a minimum of one hour while loaded to at least 50 percent of rated capacity. Deployable generators are defined as those assigned to a UTC/ESL. CE deployable generators shall be maintained in accordance with guidance outlined in **paragraph 7.2**. All other deployable generators shall be maintained by the owning unit in accordance with approved technical order data and load-tested monthly using facility load or load banks in accordance with **paragraph 7.2**.

7.4. Other Engine-Driven Equipment. Exercise gasoline-engine-driven motors for 30 minutes every month. Exercise fire pumps in accordance with UFC 3-600-02, *Operations and Maintenance: Inspection, Testing, and Maintenance of Fire Protection Systems*.

7.5. Transfer Switch. Test transfer switches according to the manufacturer's instructions. At mission-essential/critical electronic facilities, use the synchronized closed transition. All other transfer switches will be tested per **paragraph 7.1** during monthly generator tests.

7.6. Grounding Systems. At major communications and electronics facilities, test the building ground system every 21 months. The user will inspect, maintain, and repair the in-house electronic equipment ground system. Resistance measurements and any repairs to the facility ground shall be reported to the BCE. See AFI 32-1065, *Grounding Systems,* for more guidance and requirements at other facilities.

7.7. Control Systems. Test all electrical fire detection, notification, and extinguishing systems according to AFI 32-2001, *The Fire Protection Operations and Fire Prevention Program*. Test other signal and call systems at least once every 2 years.

7.8. Protective Relays. Record operations (flags) of all power systems' protective relays in a logbook used for this purpose. Keep this logbook in a secure location as close to the relay as possible, preferably inside the breaker cubicle. Record the date, which relay operated (phase A, B, C, or ground over- current), whether the trip was timed or instantaneous, and whether any reclosing relay operated to close out. These data are extremely useful for troubleshooting power system (feeder or generator) problems and for projecting corrective actions and upgrades.

8. Replacing Generators and Transfer Switches. Replacement generators or newly installed generators shall be at least 50 percent loaded. Generators and transfer switches shall be sized to carry only authorized emergency loads within a facility (see **paragraph 5**). All new or replacement 3-phase transfer switches used on 3-phase, 4-wire wye systems shall have a switched neutral conductor (4-pole switch). Maintenance bypass capability shall be included in their installation design. The preferred transfer switch maintenance bypass is accomplished using two appropriately rated double-throw switches in conjunction with the ATS. If this cannot be accomplished, the transfer switch shall be "bypass" capable. Replacement of existing 3-pole transfer switches may be accomplished by attrition. Installation of 3-pole transfer switches for new installations requires MAJCOM approval.

9. Adopted Forms and Prescribed Forms.

9.1. **Prescribed Forms:** None.

9.2. **Adopted Forms:** Air Force IMT 487, *Emergency Generator Operating Log (Inspection Testing)*

AF IMT 719, *Historical Record - Diesel-Electric Generator and System*
DD Form 1149, *Requisition and Invoice/Shipping Document*
DD Form 1348-1A, *Issue Release/Receipt Document*

DONALD J. WETEKAM, Lt General,
USAF DCS/Installations & Logistics

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

AFI 13-203, *Air Traffic Control*

AFI 32-1062, *Electrical Power Plants and Generators*

AFI 32-1064, *Electrical Safe Practices*

AFI 32-1065, *Grounding Systems*

AFI 32-2001, *The Fire Protection Operations and Fire Prevention Program*

AFI 37-138, *Records Disposition-Procedures and Responsibilities*

AFMAN 23-110, *USAF Supply Manual*, Volume IV, Part One, "Air Force Equipment System Policy and Procedures"

AFMAN 33-363, *Management of Records*

AFOSHSTD 91-501, *Air Force Consolidated Occupational Safety Standard*

AFMAN 37-123, *Management of Records*

AFOSHSTD 91-10, *Civil Engineering*

AFPD 37-1, *Air Force Information Management*

AFPD 32-10, *Installations and Facilities*

ANG ETL 01-1-1, *Air National Guard Design Policy*

ANSI C84.1, *Electric Power Systems and Equipment - Voltage Ratings (60 Hz),* **http://www.ansi.org**/

ANSI/NEMA MG 1, *Motors and Generators*, **http://www.nema.org/**

DISA Circular 350-195-2, *Auxiliary Electric Power Systems*

ETL 04-15, *Electrical Safety Guidance*

ETL 09-9, *Connection Methods for Standby Generators - 600 Volts or Less*

IEEE C2, *National Electrical Safety Code* (NESC), **http://www.ieee.org**

MIL-HDBK-1190, *Facility Planning and Design Guide*

NEMA MG 1, *Motors and Generators*, **http://www.nema.org/**

NFPA 70, *National Electrical Code* (NEC), **http://www.nfpa.org**

NFPA 70B, *Recommended Practice for Electrical Equipment Maintenance*, **http://www.nfpa.org**

NFPA 70E, *Standard for Electrical Safety in the Workplace*, **http://www.nfpa.org**

NFPA 99, *Standard for Health Care Facilities*, **http://www.nfpa.org**

NFPA 780, *Standard for the Installation of Lightning Protection Systems*, **http://www.nfpa.org**

UFC 3-520-01, *Interior Electrical Systems*,
http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4

UFC 3-560-01, *Electrical Safety O&M*, **http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4**

UFC 3-600-02, *O&M: Inspection, Testing, and Maintenance of Fire Protection Systems*,
http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4

UFC 4-510-01, *Design: Medical Military Facilities*,
http://www.wbdg.org/ccb/browse_cat.php?o=29&c=4

Abbreviations and Acronyms

AF—Air Force (as used on forms)

AFB—Air Force base

AFI—Air Force instruction

AFOSHSTD—Air Force Occupational Safety and Health Standard

AFMAN—Air Force manual

AFPD—Air Force policy directive

AFRC—Air Force Reserve Command

AFRIMS—Air Force Records Information Management System

ANG—Air National Guard

ANG ETL—Air National Guard Engineering Technical Letter

ANSI—American National Standards Institute

AS—Allowance Standard

ATS—Automatic Transfer Switch

BCE—Base Civil Engineer

CA/CRL—Custodian Authorization and Custody Receipt Listing

CBSS/GBLD—Combat Sustainment Squadron, PCCIE Flight

CE—Civil Engineer

CEMIRT—Civil Engineer Maintenance, Inspection and Repair Team

DCS—Defense Communications System

DD—Defense Department (as used on forms)

DISA—Defense Information Systems Agency

DRMO—Defense Reutilization and Marketing Office

EAID—equipment authorization inventory data

EMCS—energy management and control system

ESL—Equipment Supply Listing

ETL—Engineering Technical Letter

FPCON—Force Protection Condition

GIS—Geographical Information System

HQ AFCESA/CEM—Headquarters Air Force Civil Engineer Support Agency, Field Support Directorate

HQ AFCESA/CEN—Headquarters Air Force Civil Engineer Support Agency, Facility Energy Center

HQ AFCESA/CEO—Headquarters Air Force Civil Engineer Support Agency, Operations and Program Support Directorate

HQ AFCESA/CEOA—Headquarters Air Force Civil Engineer Support Agency, Engineer Support Division 2

HQ AFCESA/CES—Headquarters Air Force Civil Engineer Support Agency, Engineering Support Directorate

Hz—Hertz

IEEE—Institute of Electrical and Electronics Engineers

IMT—Information Management Tool

J-SIIDS—Joint-Services Interior Intrusion Detection Systems

k VA—kilovolt-amperes

kW—kilowatt

MAJCOM—major command

MEP—mobile electric power

MIL—HDBK—Military Handbook

MOA—memorandum of agreement

MOU—memorandum of understanding

NEC—National Electrical Code

NEMA—National Electrical Manufacturers Association

NFPA—National Fire Protection Association

OO—ALC/LGHC—Ogden Air Logistics Center, Commodities Management Division, Program Management Branch

O&M—operations and maintenance

POL—petroleum, oil and lubricants

PCCIE—Power Conditioning and Continuation Interfacing Equipment

RDS—records disposition schedule

RPIE—real property installed equipment

SCADA—supervisory control and data acquisition systems

UFC—Unified Facilities Criteria

UMACS—Utility Monitoring and Control Systems

UPS—Uninterruptible Power Supply

UTC—Unit Type Code

WR—ALC/LESGF—Warner Robins Air Logistics Center

Terms

Critical Loads—Electrical circuits to support mission-essential/critical functions and operations.

Depot Level Maintenance—Maintenance work on power systems and equipment performed or directed by personnel in a CE organization. It supports and supplements local (on-site, organizational, and intermediate) levels of maintenance and includes:

- Providing technical and professional help to equipment operators and maintenance personnel.
- Operating a repair facility and maintaining stock of serviceable parts, components, equipment, and assemblies needed to perform all levels of maintenance.
- Performing major inspection and major overhaul of equipment (e.g., rebuilding or manufacturing parts), reassembling system components, and testing.

Emergency Generator—Independent reserve source of electric energy that, upon failure or outage of the normal source, automatically provides reliable electric power within a specified time to critical devices and equipment whose failure to operate satisfactorily would jeopardize the health and safety of personnel or result in damage to property (NEC definition). ***Note:*** These are RPIE generators with automatic transfer switches.

Equipment Authorization Inventory Data (EAID) Equipment—Organizational equipment as described in AFMAN 23-110, *USAF Supply Manual*, Volume IV, Part One, "Air Force Equipment System Policy and Procedures".

Generator—Motor- or engine-driven device that converts mechanical energy into electrical energy by electromagnetic induction.

Intermediate Level Maintenance—Maintenance work by personnel of an organization that may or may not be responsible for equipment operation. This level of maintenance is more complex than (and directly supports) organizational maintenance, including:

- Major inspection of power systems and equipment.
- Repairing or replacing minor components and assemblies of systems and equipment.
- Routine testing and calibration of system control equipment and allied components.
- Local manufacture of parts when needed but not available through normal supply channels.

Mission—Essential/Critical—Terms used synonymously to indicate extremely important functions that are needed to support the mission. Requires BCE concurrence.

Organizational—Level Maintenance—Maintenance work performed by personnel of an organization responsible for equipment operation. This level of maintenance includes routine inspection, servicing, minor repairs, and adjustments.

Real Property Installed Equipment (RPIE)—In this instruction, RPIE is electrical equipment that aids real property functions. RPIE is permanently attached to, installed into, or built in or on government-owned or -leased real property. How this equipment is mounted (on wheels or a stationary foundation) is not significant in RPIE classifications. Coordinate with the MAJCOM when item accountability is in doubt.

Replace—To remove existing, provide new, and install.

Special—Use Facility—A facility built specifically for a high-priority mission and usually suitable only for that mission. These facilities often are not funded or budgeted through normal military construction channels and frequently are acquired through equipment funds as part of a new mission beddown package. Examples are satellite communication systems and phased array radar systems.

Standby Generator—Independent reserve source of electric energy that, upon failure or outage of the normal source, provides electric power of acceptable quality so that the user's facilities may continue in satisfactory operation (NEC definition). ***Note:*** These are EAID generators.